Landforms and Oceans

5.3 The student will demonstrate an understanding of features, processes, and changes in Earth's land and oceans. (Earth Science)

5-3.5 Compare the movement of water by waves, currents, and tides.
Taxonomy level: 2.6-B Understand Conceptual Knowledge

Previous/Future knowledge: In 3rd grade (3-5.4), students explained the relationship between the motion of an object and the pull of gravity. In 4th grade, students compared the location of Earth and the Moon in the solar system (4-3.2) and illustrated the Moon's phases and the Moon's effect on ocean tides (4-3.6). In 8th grade (8-4.4), students will explain how the motions of Earth and the Moon affect the motion of the tides.

It is essential for students to know that water on Earth can be moved in various ways. Three ways that water can be moved are by:

Waves
- The repeated movement of water is known as a *wave*.
- All waves have the same parts. The highest part is known as the *crest* and the lowest part is known as the *trough*.
- Most ocean waves are caused by winds that are blown across the surface of the water.
- A wave changes shape when it reaches the shore.
- As the top of the wave curls over it forms a *breaker*.
- Sometimes giant sea waves, called *tsunamis*, are caused by underwater earthquakes, volcanic eruptions, or landslides.

Currents
- Flowing streams of water that move continually through the ocean in a specific direction are called *currents*.
- Some currents flow at the ocean's surface and some are found deeper in the ocean.
- *Surface currents* are caused by the movement of Earth and by the force and direction of wind.
- The movement of Earth and winds causes these currents to flow along curved paths.
- Warm water and cold water are moved to different regions on Earth as a result of currents.
- *Warm surface currents* are driven by Earth's rotation from the tropics to higher latitudes.
- *Cold surface currents* are driven by Earth's rotation from the polar latitudes toward the equator.

Tides
- Several times during the day, the level of water at the ocean shore changes.
- This regular rise and fall of waters in oceans and seas is called a *tide*.
- Tides are caused by the pull of the Moon's *gravity* on Earth.
- As the Moon moves in relation to Earth, the water on Earth moves too.
- As Earth spins on its axis, the part of the ocean facing the Moon will bulge.
- *High tide* occurs when the water level is at its highest point.
- *Low tide* occurs when the water level is at it lowest point.
- Tides rise and fall about twice a day.

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It is not essential for students to know about the formation of deep-ocean currents; or explain how the motions of Earth and the Moon affect the motion of the tides, as this will be discussed further in 8th grade.

Assessment Guidelines:
The objective of this indicator is to *compare* the ways that waves, currents, and tides move water; therefore, the primary focus of assessment should be to detect ways that water is moved by these ocean movements. However, appropriate assessments should also require students to *identify* a wave, current, or tides based on its description; *classify* a wave, current, or tide by their characteristics; *identify* parts of a wave; *compare* high and low tides; or *compare* warm and cold surface currents.